

In the Claims

1. (Currently Amended) A metallic material for fuel cells comprising:

0.006 percent by mass or less of C;

0.02 to 0.13 percent by mass of Si;

2.0 percent by mass or less of Mn;

~~14.87~~19.65 to ~~[[40]]~~ 20.45 percent by mass of Cr;

0.11 to 5.0 percent by mass of Mo;

0.21 to 3.0 percent by mass of Nb;

at least one element selected from the group consisting of Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Zr, and Hf in a total of 0.03 to 1.0 percent by mass; and

the balance composed of Fe and inevitable impurities;

wherein $\leq 0.3 \leq \text{Mo/Nb} \leq 9.57$ is satisfied, and further comprising a precipitate containing Fe, Cr and Si at contents on the basis of the metallic material satisfying the following equation (1):

$$[\text{precipitated Fe}] + [\text{precipitated Cr}] + [\text{precipitated Si}] \geq 0.01 \text{ percent by mass} \quad \dots (1)$$

wherein,

[precipitated Fe]: content (percent by mass) of Fe in the precipitate;

[precipitated Cr]: content (percent by mass) of Cr in the precipitate; and

[precipitated Si]: content (percent by mass) of Si in the precipitate, and the metallic material;

wherein,

when in use at a cell operating temperature of 800°C for at least 1,000 hours or more, the Fe, Cr and Si contents in the precipitate on the basis of the metallic material satisfy the following equation (2):

$$[\text{precipitated Fe}] + [\text{precipitated Cr}] + [\text{precipitated Si}] \geq 0.03 \text{ percent by mass} \quad \dots (2)$$

wherein,

[precipitated Fe]: content (percent by mass) of Fe in the precipitate;

[precipitated Cr]: content (percent by mass) of Cr in the precipitate; and

[precipitated Si]: content (percent by mass) of Si in the precipitate.

2-3. (Cancelled)

4. (Previously Presented) The metallic material for fuel cells according to claim 1, wherein the metallic material for fuel cells is a hot-rolled material.

5. (Previously Presented) The metallic material for fuel cells according to claim 1, wherein the metallic material for fuel cells is a cold-rolled material.

6. (Original) The metallic material for fuel cells according to claim 4 or 5, wherein the metallic material is further subjected to a precipitation treatment so that the Fe, Cr and Si contents in the precipitate on the basis of the metallic material satisfy the following equation (3):

$$[\text{precipitated Fe}] + [\text{precipitated Cr}] + [\text{precipitated Si}] \geq 0.02 \text{ percent by mass} \quad \dots (3)$$

wherein,

[precipitated Fe]: content (percent by mass) of Fe in the precipitate;

[precipitated Cr]: content (percent by mass) of Cr in the precipitate; and

[precipitated Si]: content (percent by mass) of Si in the precipitate.

7. (Previously Presented) The metallic material for fuel cells according to claim 1, wherein the metallic material for fuel cells is used for solid-oxide fuel cells.

8. (Previously Presented) The metallic material for fuel cells according to claim 1, wherein the metallic material for fuel cells is used for interconnects of solid-oxide fuel cells.

9. (Previously Presented) A solid-oxide fuel cell using the metallic material for fuel cells according to claim 1.

10. (Currently Amended) A method for producing a metallic material for fuel cells comprising:

re-heating a steel material, if required;
hot-rolling the steel material; and, if required,
annealing and ~~picking~~pickling the hot-rolled sheet;
cold rolling the steel material; and
annealing the steel material;

wherein the steel material is adjusted to contain:

0.006 percent by mass or less of C;
0.02 to 0.13 percent by mass of Si;
2.0 percent by mass or less of Mn;
~~14.87~~19.65 to ~~20.45~~ percent by mass of Cr;

0.11 to 5.0 percent by mass of Mo;

0.21 to 3.0 percent by mass of Nb;

at least one of element selection from Sc, Y, La, Ce, Pr, Nd, Pm, Sm, Zr, and Hf in a total of

0.03 to 1.0 percent by mass; and

the balance composed of Fe and inevitable impurities; and

$0.3 \leq \text{Mo/Nb} \leq 9.57$ is satisfied, and wherein the metallic material for fuel cells further comprises a precipitate containing Fe, Cr and Si at contents on the basis of the metallic material satisfying the following equation (1):

$$[\text{precipitated Fe}] + [\text{precipitated Cr}] + [\text{precipitated Si}] \geq 0.01 \text{ percent by mass} \quad \dots (1)$$

wherein,

[precipitated Fe]: content (percent by mass) of Fe in the precipitate;

[precipitated Cr]: content (percent by mass) of Cr in the precipitate; and

[precipitated Si]: content (percent by mass) of Si in the precipitate.

11. (Cancelled)

12. (Currently Amended) The method according to claim 10, further comprising ~~cold-rolling~~
~~or cold-rolling, annealing, and then pickling~~ after annealing the cold rolled steel material.

13. (Previously Presented) The method according to claim 10, further comprising performing a precipitation treatment of the metallic material for fuel cells so that the Fe, Cr and Si contents in the precipitate on the basis of the metallic material satisfy the following equation (3):

$$[\text{precipitated Fe}] + [\text{precipitated Cr}] + [\text{precipitated Si}] \geq 0.02 \text{ percent by mass} \quad \dots (3)$$

wherein,

[precipitated Fe]: content (percent by mass) of Fe in the precipitate;

[precipitated Cr]: content (percent by mass) of Cr in the precipitate; and

[precipitated Si]: content (percent by mass) of Si in the precipitate.

14. (Previously Presented) The method according to claim 10, further comprising pressing the metallic material for fuel cells.

15. (Cancelled)

16. (Previously Presented) The method according to claim 10, further comprising corrugating the metallic material for fuel cells.

17. (Cancelled)

18. (Previously Presented) The method according to claim 10, wherein the metallic material for fuel cells is used for solid-oxide fuel cells.

19. (Previously Presented) The method according to claim 10, wherein the metallic material for fuel cells is used for interconnects of solid-oxide fuel cells.

20. (Previously Presented) The metallic material for fuel cells according to claim 1, having an electrical resistance of about $30 \text{ m}\Omega \text{ cm}^2$ or less at 800° C .

21. (New) The metallic material for fuel cells according to claim 1, wherein the precipitate contains Mo and Nb combined with Fe, Cr and Si in grain boundaries of the metallic material.

22. (New) The method according to claim 10, wherein the precipitate contains Mo and Nb combined with Fe, Cr and Si in grain boundaries of the metallic material.